iBike® Newton™ Power Meter Operating Instructions Firmware 600+

June 2012

The Way To Measure Power

These instructions are divided into two parts:

- **PART ONE provides basic instructions for all Newton users**

- **PART TWO provides additional instructions for extra iBike Newton features of interest to advanced cyclists and coaches**

> **To learn how to install your iBike Newton mount, please refer to the instructions included separately.**

Other resources:

Enjoy the large community of iBike owners participating in the iBike Forum:

www.ibikeforum.com

OR, please email us at

technicalsupport@velocomp.com

Also, check out our blog:

www.ibikeblog.com

Make sure to visit our website frequently to get the very latest in iBike product, software, and information updates:

www.ibikesports.com

PART ONE
BASIC OPERATION

PART TWO
ADVANCED FEATURES

NEWTON RECHARGEABLE BATTERY

Your Newton includes a rechargeable battery. The battery is permanently installed in the case and cannot be removed.

Before using your Newton for the first time, make sure to fully charge your battery. Attach the USB cable to the connector located on the bottom of the Newton case, then plug in the USB connector to your computer port, or to any USB power source.

Your Newton battery charges fully in about 2 hours.

NEWTON BATTERY LIFE

Your Newton battery will provide you about 40 hours of continuous ride time between recharges, in cold weather or warm.

Of course, each time you plug your Newton into your computer, the battery will recharge very quickly.

You can check the percentage of battery energy remaining in your Newton by going into Setup (Press-hold top button), and scrolling with the top button to find "Batt %".

Your Newton battery can be completely charged and discharged about 300 times before it will require factory replacement.

RESETTING YOUR NEWTON WITH A "HARD RESET" COMMAND

A Hard Reset reboots and restarts your Newton's microcomputer.

Unlike all prior versions of iBikes, the Newton contains a permanently installed battery. So, it is impossible to remove the battery as part of a Hard Reset procedure.

In the Newton, you do a "Hard Reset" by doing the following:

Simultaneously press-hold the left, bottom, right, and center buttons. The screen will go blank. Then, release the button and the computer will restart.

All of your stored information will be retained, with the exception of date and time.

After doing a Hard Reset of your Newton, we recommend you reset the Date and Time of your Newton with the Isaac Software menu command Device/Setup/Set Date and Time

MOUNT AND SENSOR INSTALLATION

MOUNT

You'll need to attach your Newton mount to your stem or handlebars (depending on which kind of mount you purchased).   Follow the instructions included. Locate your mount so that your Newton, when attached, will have a clear view of the wind.

SENSORS

Attach your iBike speed/cadence sensor to your bike using the instructions included.

MAKE SURE SPEED AND CADENCE MAGNETS ARE PROPERLY POSITIONED, SO THAT EACH PASSES WITHIN 1-2 COIN WIDTHS OF THE CORRESPONDING SENSOR.

If your bike already has ANT+ sensors installed on it, your Newton will work properly with these sensors.

NEWTON SETUP AND CALIBRATION PROCESS

Before using your Newton on the road, it is essential to complete a one-time setup and calibration process *for each bike*. **YOUR NEWTON WON'T WORK PROPERLY UNTIL THE SETUP PROCESS HAS BEEN COMPLETED**.

The setup process involves four simple steps:

1) Enter basic information into the Newton's memory
2) Pair your Newton to the wireless sensors
3) Perform a Tilt Calibration
4) Perform a 2 mile long calibration ride

Steps 2 through 4 are performed with your Newton attached to your bike.

ENTERING BASIC INFORMATION WITH ISAAC SOFTWARE

The Isaac software, included with your iBike Newton, provides you an extremely simple way to enter your basic information. Install the Isaac software on your computer, then connect your Newton to your computer and launch the Isaac software.

Go to Device/Device Setup…and follow the prompts on the computer screen to enter your information.

After completing the Basic Information prompts, attach your Newton to your bike and proceed to Sensor Pairing.

SENSOR PAIRING

Your Newton will work with any wireless ANT+ sensor.

Install your speed/cadence sensor on your bike, following the instructions included separately. If you use an HR strap, fasten it to your body.

To pair your Newton to your wireless sensors, press-hold the TOP AND BOTTOM arrows *simultaneously*, until a "Scan" message appears. After a few moments the pairing process will be completed and your Newton will remember permanently the wireless IDs of your sensors.

Proceed to the Tilt Calibration step, which is accessed in the "Setup Screens" of your Newton.

NEWTON "SETUP" MODE

All of the required setup and calibration steps are accessed through the Set-Up mode.

How to *enter* the Set-Up mode
1. Click any button to wake-up the Newton
2. *Press and hold the up-arrow for about 2 seconds* (UP-ARROW FOR SET-UP); the words "set up" will appear. When the set-up screen appears release the button.

How to *exit* the Set-Up mode
1. While in Setup mode, press-hold the UP arrow for two seconds, OR
2. Do not press any button for 30 seconds.

NAVIGATING THE NEWTON SETUP SCREENS

Once entering the "Setup" mode (press-hold up arrow for two seconds), scroll to any setup screen by clicking the up or down arrows located on the red button:

Click the up arrow: advance to the NEXT setup screen,

Click the down arrow: return to the PREVIOUS setup screen

Each setup screen displays one step of the Newton's setup process.

Setup screens are organized like a Rolodex. You can scroll forwards and backwards to any setup screen. When you reach the final screen and click the up arrow to advance to the next screen, you will return to the first screen.

TILT CALIBRATION

The Tilt calibration allows your iBike Newton to measure hill slope with extremely high precision.

To perform the Tilt calibration, do the following:

1. Enter Setup mode (press-hold up arrow), and click-scroll with the top arrow until you come to a screen that says "Tilt".

2. Set your bike on reasonably level ground. Mark the spots where the wheels touch the pavement.

> **TIP**: DO NOT PERFORM A TILT CALIBRATION ON A ROAD WITH LOOSE STONES OR JAGGED PAVEMENT. YOU MAY GET POOR RESULTS.

3. **Hold the bike still and upright**, *with the front wheel pointed straight ahead*.
4. Click the center button to start the tilt calibration process.

> **IMPORTANT**: YOU <u>MUST</u> HOLD THE BIKE STILL DURING EACH STEP. AN EASY WAY TO KEEP YOUR BIKE FROM MOVING IS TO WEDGE YOUR FOOT IN FRONT OF THE BACK TIRE.

5. The screen says "HOLD STILL" and the horizontal bar moves from right to left, towards zero. <u>Do not move the bike</u>.
   Once the bar disappears, the screen flashes "turn 180 degrees".
6. Turn the bike around 180 degrees; the bike now points <u>in exactly the opposite direction</u> *with the tires resting on the same two spots*.
7. **Hold the bike still and upright**, with the front wheel pointed straight ahead. Click the center button. The horizontal bar counts down to zero. <u>Do not move the bike.</u>
8. Once the bar disappears, the words "turn 180" flashes *again*. Turn the bike 180 degrees; the bike now points <u>in the original direction</u> *with the tires resting on the same two spots.*
9. **Hold the bike still and upright**, with the front wheel pointed straight ahead. Click the center button. The horizontal bar counts down to zero. <u>Do not move the bike.</u>
10. Once the bar disappears, if the calibration is good the words "GOOD TILT" flash a few times and the Newton advances to the CAL WIND screen.
11. If you moved the bike during any of the three "countdowns" you may get the message "BAD TILT". If so, repeat steps 2-10, making sure you point the bike straight ahead and hold it as still as possible during the calibrations.

The "Tilt Calibration" process is performed only one time; you do not need to repeat it

THE CALIBRATION RIDE

The Calibration Ride improves the accuracy of your wind sensor and tilt sensor, and also improves the accuracy of your estimated aerodynamic and frictional drag coefficients.

The Calibration Ride is 2 miles (3.2 KM) long. The cyclist rides one mile out, turns around, then rides back on the same road.

Here's how to perform the Calibration Ride:

1) Ride your bike to the location where you will start the Cal Ride. While riding the

Newton will show readings but power and wind speed likely will not be accurate.
2) When ready to start the Cal Ride, press-hold the up arrow to enter Setup.
3) Click the up arrow twice to find the "Cal Ride" screen.
4) To start the Cal Ride click the center button. You'll see the following screen:

10) Begin your Cal Ride. Ride at a leisurely pace, in your normal riding position.
11) NO DRAFTING ALLOWED!
12) During your ride out the Newton center window will tell you how far you've traveled. Your goal is to travel at least 1 mile from the starting point.
13) Once you've traveled 1 miles your Newton will tell you to turn around. You will see these screens <u>flash</u> in succession, telling you exactly what to do: (Go back, turn 180 degrees)
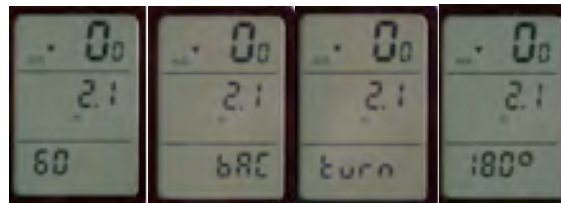
14) When you see these messages, **STOP, THEN TURN AROUND.** The flashing messages disappear the word "Bac" appears in the bottom window, and does not flash.

TIP: IT'S OK TO RIDE OUT MORE THAN ONE MILE. AS LONG AS YOUR BIKE SPEED REMAINS ABOVE 10 MPH THE NEWTON WILL CONTINUE TO RECORD DATA EVEN WHILE FLASHING "GO BAC". IF YOU RIDE MORE THAN ONE MILE YOUR CAL RIDE WILL BE EVEN MORE ACCURATE; A FOUR MILE OUT-AND-BACK RIDE IS EXCELLENT!

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14) As you ride back your Newton distance measurement will count down to zero, telling you how much distance remains until the end of the Cal Ride.

IMPORTANT: RIDE BACK ON THE SAME ROADS

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17) At the end of your calibration ride your Newton will notify you that the cal ride is done ("Cal Done"). After a few seconds your Newton will exit setup.

NOTICE: ONCE BEGINNING YOUR CAL RIDE, IF YOU WISH TO TERMINATE IT, PRESS-HOLD THE CENTER BUTTON FOR TWO SECONDS. THIS ABORTS THE CAL RIDE AND LEAVES ANY PRIOR RESULTS UNCHANGED.

YOU'RE READY TO RIDE!

THE NEWTON PROFILE

The Basic Information you entered with the Isaac software, in combination wireless sensor Pairing, Tilt Calibration, and Cal Ride, together form a "Profile", a description of all the things that make your Newton work properly with you and your particular bike.

Your Newton can store up to <u>four</u> Profiles in its memory, and your Isaac software can store *as many profiles as you like*. Any four of the profiles stored on your Isaac software can be uploaded into your Newton.

IMPORTANT: TO LEARN HOW TO STORE A PROFILE ON YOUR COMPUTER AND TO LOAD A PROFILE INTO YOUR NEWTON, REFER TO THE "ISAAC SOFTWARE INSTRUCTIONS".

By default, your Newton is set to Profile 1. So, all of the information gathered as part of your original Newton setup is stored in profile 1.

You can store up to four different profiles in your Newton's memory. This is useful if you own multiple bikes, or have several different riding positions on the same bike (for example, hoods and TT).

Here is how to select a different profile:

Enter Setup and click the down arrow repeatedly to find the Set Prof (Set Profile) screen:
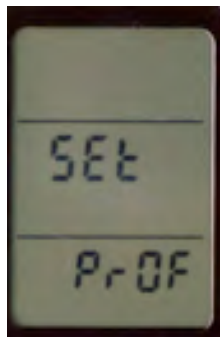
Click the center button; the default setting is profile 1
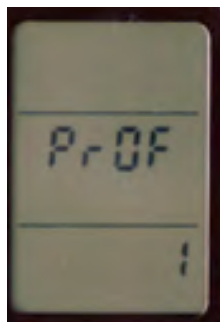
Any Setup data you have entered and any calibrations you have performed are stored in "Profile 1".

To select a different profile, click the up arrow and use the up arrow to change the setting to the profile number you wish to select. To accept your choice, click the center button.

USING PROFILES

If you have multiple profiles stored in your Newton, say 3 profiles for three different bikes, to use your Newton's Profile 3 with bike #3, enter setup, scroll to Set Prof, select "Prof 3", then click the center button to accept. Exit setup. Your Newton will now load all the settings for Profile 3 into memory and you're ready to ride.

CREATING A NEW PROFILE

If you wish to create a new Profile, enter Setup and click-scroll to Set Prof. The profile currently in use will be displayed. Select a different profile number following the instructions above.

Then, use the Isaac software to enter Basic Information for the new profile, do a Sensor Pairing, Tilt Calibration, and Cal Ride. This information will be stored in the Profile number you have selected.

IMPORTANT: THE PROFILE DATA STORED PREVIOUSLY FOR THE PROFILE SELECTED WILL BE OVERWRITTEN

IMPORTANT: ANY PROFILE DATA FOR ANY OTHER PROFILE WILL BE UNAFFECTED.

USING NEWTON BUTTONS AND FEATURES

This section describes the functions and features of the five control buttons on your iBike Newton (center button, up, down, left, right arrow).
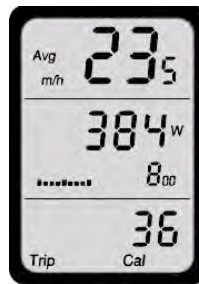
Center Button: BIKE COMPUTER AND POWER SCREENS

The Newton has two *main screens*:

> o bike computer screen
> o power screen

The bike computer screen shows bike speed, trip distance, and trip time. The power screen shows speed, power, cadence, and Heart Rate (wireless mount).

Bike Computer   Power

Click the center button to toggle between Bike Computer and Power main screens.

NOTICE: ON THE BIKE COMPUTER SCREEN, THE MIDDLE WINDOW ALTERNATES AUTOMATICALLY BETWEEN DISTANCE AND POWER.
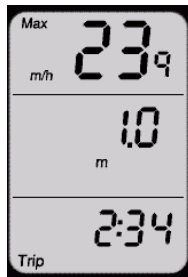
Top Arrow: AVERAGE (AVG) AND MAXIMUM (MAX) SCREENS

Clicking the top arrow toggles between the average and maximum values of your current screen's display:

> o Click the up arrow once to see average values (illustration shows average values for Bike Computer screen).

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o Click top arrow again to see max values.

IMPORTANT: To return to the main screen, click the center button.

Bottom Arrow: HILL SLOPE AND WIND SPEED DISPLAY

No matter which main screen you are using, at any point in your ride you can find out the slope of the hill you're climbing, or the amount of head wind or tail wind.

o Click the down arrow once to see hill slope in the top window.

o Click the down arrow again to see opposing wind speed in the top window.

To return to the main screen click the center button.

TIP: PRESS-HOLD THE BOTTOM ARROW FOR TWO SECONDS TO TURN "AUTO-HILL SLOPE DISPLAY" ON OR OFF. SEE BELOW FOR MORE DETAILS ABOUT AUTO-HILL FUNCTION.

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Right Arrow: ENVIRO (Environment) SCREENS/FIT TRAIN MODE

You can learn useful information about your ride by clicking the Enviro button (right arrow).

○ Click the right arrow: Temperature and current time are displayed.

```
78°
 F
10:07
```
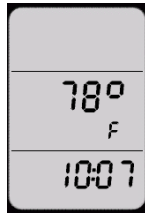
○ Click the right arrow again (enviro screen 2): current hill slope, wind speed, and current elevation are displayed.

○ Click the right arrow again (enviro screen 3): Date and time are displayed.

```
2006
06-07
```

To return to the main screen click the center button.

TIP: PRESS-HOLD THE RIGHT ARROW FOR TWO SECONDS TO ENTER THE "FIT TRAIN" SCREENS. SEE BELOW FOR MORE DETAILS ABOUT FITNESS TRAINING SCREENS.

Left Arrow: TOTAL SCREENS/LAP SCREEN

You can get summary statistics for the entire ride with the "Total" screens. Total screens are shown by clicking the left arrow.

• Click left arrow once: Total energy expended (in kilojoules or KJ) and calories (Kcal) are displayed.

• Click left arrow again, distance traveled and elevation gained are displayed.

OPTIONAL: IF YOU HAVE SELECTED "TSS ON" IN THE RACR SEQUENCE, THE NEXT THREE SCREENS SHOW NORMALIZED POWER (NP), INTENSITY FACTOR (IF) AND TRAINING STRESS SCORE (TSS).

• Click the left arrow again and "Log x% Full" shown ("x" is a number between 0 and 99). This screen indicates the amount of memory used (logged) by your ride files. When the screen says 0% full your ride memory is empty; when it says 99% full your ride memory is full.

TIP: THE NEWTON RECORDS AT ONE SECOND INTERVALS (25-50 HOURS OF DATA RECORDING) OR FIVE SECOND INTERVALS (125-250 HOURS OF DATA RECORDING). SELECT THE RECORD INTERVAL IN THE SETUP SCREEN.

TIP: YOU WILL GET WARNING MESSAGES WHEN YOUR RIDE MEMORY IS 80% FULL AND 90% FULL. DOWNLOAD YOUR RIDES AS SOON AS POSSIBLE OR YOU MAY LOSE YOUR MOST RECENT RIDE FILE!

TIP: YOU CAN ERASE YOUR MEMORY WITH A NEWTON COMMAND THAT LOCATED IN THE SETUP MENU. THE "ERAS DATA" COMMAND CLEARS ALL YOUR MEMORY AND ERASE ALL RIDES STORED IN YOUR NEWTON.

To return to the main screen click the center button.

TIP: PRESS-HOLD THE LEFT ARROW FOR TWO SECONDS TO ENTER THE LAP TIMER SCREENS. SEE BELOW FOR MORE DETAILS ABOUT LAP TIMER.

NEWTON TRIP DATA AND RIDE FILES

iBike Newton "Trips"

The Newton gathers, stores, analyzes, and displays data as "trips".   Information from each trip is recorded in a "Ride File".

Generally, each time you start a new day's ride you'll want to start a new trip. A simple and fast "Trip-Reset" (described below) closes the previous ride file, creates a new Newton Trip, and opens a new ride file.

Also, if your Newton sleeps for more than 4 hours it will automatically begin a new Trip and ride file.

A "Trip Reset" starts a new ride file and resets the NEWTON screens with zero readings of:
*   Trip odometer
*   Trip time
*   Lap Timer and lap stats
*   Instantaneous, average and maximum:
    > Power
    > kilojoules
    > speed
    > hill slope
    > wind speed
    > elevation gain

Starting a New Trip (Trip-Reset):

You can start a new trip and new ride file at any time. Here is how:

> 1. Press-hold the center button for two seconds.
> 2. The screen says "trip reset". The word "trip" does not flash and the word "reset" does flash.

> 3. **To confirm your trip-reset, click the center button again. Both words ("trip", "reset") will flash, then the main screen will return**.
> 4. If you decide you DON'T want to complete the trip-reset, cancel the trip reset by waiting for four seconds, or by clicking any button EXCEPT the center button. The message "not rESEt" will appear and will remain on the screen until you click the center button.

IMPORTANT: UNLESS YOU CONFIRM THE TRIP RESET BY CLICKING THE CENTER BUTTON A SECOND TIME, YOU WILL NOT COMPLETE THE TRIP RESET AND YOU WON'T START A NEW RIDE FILE!

TIP: You can do a trip reset any time, even while riding.

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HOW TO START YOUR NEWTON PRIOR TO A RIDE

Each time you ride with the Newton, follow these simple steps:

1) Attach your Newton to your mount. Make sure to secure your Newton to the mount with the mount's bolt.
2) Click the center button of your Newton to awaken it. If you are using a heart rate strap, make sure to stand next to your Newton until your Newton competes its startup process

At the end of the startup process the wireless sensors will be detected automatically by the Newton.

Once the main Newton screen appears you're ready to ride!

NOTE: IF YOUR RIDE MEMORY IS 80% FULL OR MORE YOU WILL SEE WARNING MESSAGES APPEAR. YOU CAN ERASE YOUR RIDE MEMORY FROM THE SETUP SCREEN, "ERAS DATA".

PART TWO

ADVANCED FEATURES

GETTING MORE FROM YOUR NEWTON: "USER" AND "RACR" SEQUENCES

For most cyclists it is not necessary to use the USER and RACR sequences; however, there are some extra features available that can be accessed from these sequences.

The USER sequence contains features and settings of value to many iBike Newton users.

The RACR (racer) sequence contains features and settings of interest to advanced users and racers.

USER SEQUENCE

To access the USER sequence, enter Setup then click the up arrow to find the USER screen. If the screen says "USER YES" then click the up arrow to enter the USER sequence; if the screen says USER NO, then click the center button, select YES with the up arrow, then click the center button to accept USER YES. Then, click the up arrow to enter the USER sequence. Here are the steps included in the USER sequence:

"USER YES", click the up arrow successively to perform:

- Set trainer mode (standard with iAero, optional with iPro): "**TRNR**": See page 43 for details
- Set Year: "**YEAR**"
- Set Date: "**DATE**"
- Set Time: "**CLOC**"

TIP: YEAR, DATE AND TIME CAN BE ENTERED INSTANTLY USING THE Isaac SOFTWARE.

- Set Display Contrast: "**LCD**"

Also, there are four other selections you can make in the User Sequence:

- Perform Coast Down calibration: "**COAST**" (special instructions below)
- Display ambient wind speed: "**ABS WIND**"
- Perform Fitness Test: "**FIT TEST**" (special instructions below)

"COAST DOWN" PROCEDURE

When you ride at high speed the effects of wind, bike aerodynamics, and riding position become even more significant. These effects are related to aerodynamic drag, commonly called CdA.

The Fast Start sequence *estimates* your CdA. The estimates of CdA made by the Newton are the result of considerable testing and experience. For 99% of riders, estimated CdA and Crr provide both consistent and very accurate results under a wide variety of cycling conditions.

If you would like to measure your CdA (and, optionally Crr), then the coast down procedure is an advanced feature that is available.

The coast down calibration found in the User sequence *measures* the aerodynamic (and optionally, friction) drag coefficients that are particular to each cyclist, riding position, bike type, tires, and road type. These drag coefficients are stored in the Newton's memory (in a Profile) and are used in power calculations.

The coast down procedure is this: accelerate to 20 mph (32 kph), *then stop pedaling*. Your bike will slow due to aerodynamic and frictional drag (your bike may also slow due to the effect of hill slope, but the Newton factors hill slope effects into its calculations). Once you slow to 8 mph (13 kph) the coast down is complete. For much better accuracy, repeat the coast down 5-8 times, then analyze your results in the Isaac software to get the best composite measurement.

> The Coast Down measurement works very well when its steps are followed carefully. However, if the procedure is not followed EXACTLY, then it is likely that your Newton will be more poorly calibrated than it was prior to the Coast Downs! So, if you decide to do coast downs, please read the instructions carefully and follow them exactly.

Here is the Coast Down procedure:

1. **Before doing Coast Downs you MUST complete the Fast Start sequence AND the Calibration Ride.**
2. Wear the clothing, bike helmet, and shoes you're going to use during your rides.
3. ***Find a fairly level to uphill road,*** with few cars, where you can coast on the road for about 1/4 mile, <u>without stopping, hitting big bumps in the road, making sharp turns, or being subjected to wind gusts caused by passing traffic or other cyclists.</u>

> **NOTE**: THE ROAD <u>MUST</u> BE MOSTLY LEVEL TO SLIGHTLY UPHILL. IF THE ROAD HAS TOO MUCH DOWNHILL YOU WON'T SLOW TO 8 MPH!

4. Just before starting your Coast Down, enter Setup, then scroll to USER. If "USER YES" is shown, click the up arrow to enter the user sequence. If "USER NO" is shown, click the center button (to make the word "NO" flash), then select YES with the up arrow, then click the center button to accept ("USER YES"). Then, click the up arrow to enter the User sequence.
5. In the User sequence, click the up arrow button until you find the "Coast" menu. You will see the word "Coast" in the bottom window.

```
      0 w

    COASt
```
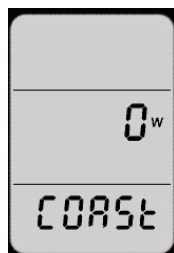
6. To begin the Coast Down procedure, click the center button.
7. Before going to the coast down screen your Newton will check to see how recently you performed the "Tilt" and "Cal Wind" steps. If these steps were performed more than 30 minutes prior to the start of your Coast Downs, you will be required to do them again. This assures maximum accuracy of your Coast Downs. The word "Start" will flash after performing Tilt and Cal Wind calibrations. Click the center button
8. The Coast Down screen shows the word "Fast", and your current bike speed appears in the display.

```
  m/h  15 8

    FASt

   |...|...|...|..
```

9. When this screen is shown, pedal your bike faster BUT INCREASE SPEED A LEISURELY MANNER, making sure you remain ride in your usual ride position.
10. As you go faster the horizontal bar in the screen will start to fill. Your goal is to get to 20 mph (32KPH).
11. Once you've reached full speed, the word "coast" will appear. Stop pedaling IMMEDIATELY; you will begin to slow down due to aerodynamic and frictional drag.

```
     20 2

    COASt
```

12. **Make sure you remain in your usual riding position during the coast down**.
13. As you coast the bike will slow down and the Newton will measure your drag coefficients (aerodynamic and frictional).

TIP: COAST DOWN DATA IS COLLECTED BETWEEN THE SPEEDS OF 18 MPH AND 8 MPH.

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14. Do not pedal your bike, apply the brakes, or make abrupt moves with the front wheel during the coast down.

15. As the bike slows the horizontal bar will empty and your bike speed will drop.
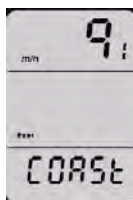
16. Once you get to a speed of about 8 mph, the words "DONE COAST" will flash for a few seconds, then the screen "CALC COAST" (calculating coast) will appear, then main coast down screen will appear, indicating that the measurement is complete.

CRITICAL: FOR BEST RESULTS **PERFORM 5 TO 8 COAST DOWNS**, BACK-TO-BACK. **RETURN TO THE PLACE WHERE YOU STARTED YOUR COAST DOWN AND DO MORE COAST DOWNS BY REPEATING STEPS 6-15.**

TIP: IF YOU ACCIDENTALLY INITIATE THE COAST-DOWN CALIBRATION PROCESS YOU MAY STOP IT BY CLICKING THE CENTER BUTTON. THE SCREEN WILL SAY "Abrt COASt" (abort coast). THE COAST-DOWN READINGS CURRENTLY STORED WILL BE UNCHANGED.

RACER TIP: BY DEFAULT, THE COAST DOWN USES A FIXED VALUE OF ROLLING RESISTANCE (CRR = 0.0055) IN THE COAST DOWN MEASUREMENT.

IMPORTANT: YOUR COAST DOWN AND CAL RIDE DATA **MUST** BE DOWNLOADED AND ANALYZED IN THE ISAAC SOFTWARE TO PROVIDE YOU THE BEST RESULTS. SEE THE "ISAAC SOFTWARE INSTRUCTIONS" FOR DETAILS.

SETTING WIND SPEED DISPLAY ("ABS WIND YES/NO")

Your Newton measures opposing wind speed. Opposing wind includes both the "absolute" ground wind that comes from nature, and the additional opposing wind caused by moving you and your bike through the air. You can display opposing wind speed in one of two ways:

1) ABS WIND NO shows the TOTAL amount of wind opposing you. So, if you're riding at 20 mph and there is a headwind of 5 mph, your Newton will display the opposing wind as 25 mph.
2) "ABS WIND YES" shows *only* the ground wind force opposing you. In the same example as above, the Newton would show a wind speed of 5 mph. NOTE: if you have a tail wind the Newton will show the magnitude of the tail wind. ABS WIND YES is the default setting of your Newton.

The "ABS WIND NO/YES" selection is in the "USER" sequence. Make your selection with the center button and up arrow, then click the center button again to accept.

FITNESS TEST (FTP TEST)

Your Newton includes a built-in, power-based fitness test that measures your cycling fitness. It is a very simple test: you ride as hard as you can for 20 minutes. Then, the Newton computes the average watts you held during the test, divided by your body weight in KG. This "Watts per kilogram" ratio is a simple and critical measure of cycling fitness. Simply put, the higher your watts per kilogram the more fit you are and the faster you'll go.

Also, the average watts held during the Fitness Test, times the multiplier of 0.95, is an excellent measure of your Functional Threshold Power (FTP). FTP is used by most experts as a key measure of your overall aerobic limit and cycling fitness.

The Newton firmware includes a table developed by professional racer and noted cycling coach Boyd Johnson that interprets your W/KG score as a fitness level from one to ten. Your fitness level is based on your W/KG measurement and your sex. Here is the table that is loaded into the Newton firmware:

Fitness Level	w/kg male	w/kg female
1	0-2	0-1.5
2	2.01-2.45	1.51-2.08
3	2.46-2.8	2.09-2.4
4	2.81-3.46	2.41-2.94
5	3.47-3.8	2.95-3.23
6	3.81-4.25	3.24-3.62
7	4.26-4.82	3.62-4.1
8	4.83-5.27	4.11-4.48
9	5.28-5.75	4.49-4.86
10	5.75+	4.87+

So, for example, if you are male and your 20 minute test returns a W/KG measurement of 2.48, then your fitness level is "3" (the female would score a higher fitness level of "4" for the same W/KG result).

What can you do with this test? Three things:

1) You can use the test result to provide you and objective and meaningful assessment of your current level of cycling fitness
2) You can use the test result in conjunction with built-in fat burning, cardio, and strength workouts that are targeted to your specific level of fitness. These workouts will help you improve your cycling fitness quickly and efficiently. The workout feature is described in the next section
3) You can repeat the fitness test during the season, and quantify the improvements achieved by your cycling efforts
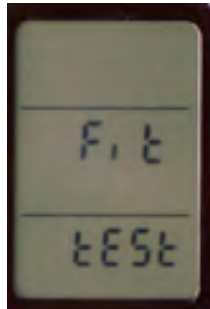
At the end of the 20 minute test your Newton will show you your test result, expressed

both as your W/KG ratio and as your fitness level.
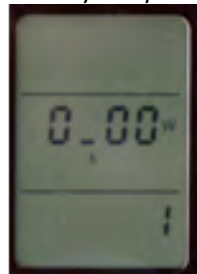
Here is how to do the fitness test:

Enter Setup and click the up arrow to find the User sequence. Using the center button and up arrow, set "USER YES".

Then, click the up arrow to find the Fit Test screen in the User sequence:
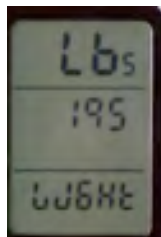

Click the center button of your Newton to start the test sequence.

The first screen you'll see is the result from your *previous* Fitness Test.

Your watts-per-kilogram (W/KG) number will be shown in the center window. It will read x_yz, where x,y and z are numbers, and the underscore indicates a decimal point. For example, 3_54 indicates a watts/kg result of 3.54. The bottom window shows your fitness level associated with your W/KG test result.

Click the center button to continue. You will be asked to enter your *body weight only*; **DO NOT INCLUDE THE WEIGHT OF YOUR BIKE, EQUIPMENT, AND CLOTHING**. If you're sure of your body weight then enter it; if you haven't weighed yourself recently take the time to get on a scale so you'll have the right weight working in the calculations.

Click the center button to continue; you'll be asked to tell the Newton if you are female or male. If you are male select the screen that says "FE NO" (not female); if you are female click the up arrow to select "FE YES" (female yes). Then, click the center button to continue
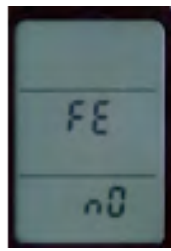
Now, your Newton is set up for the test.

Find a place where you can cycle at a very aggressive pace for 20 minutes. **You need to be pedaling during the entire test**, so a hilly course is not a good idea (on the downhills you'll likely be coasting and this will reduce your fitness score). A flat course without stoplights and traffic is best; depending on how fast you can pedal you should try to find a course that is 5 to 8 miles long.

Before beginning the test ride around for a few minutes to warm up. When you are ready click the center button to start the fitness test. The screen should look like this:

Click the center button to start the test. You will see this screen, indicating that the test will start after a 10 second countdown:
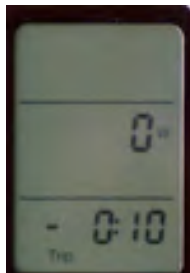
The instant you start pedaling the bottom window clock will start counting down to zero. When the clock reaches 0:00 the test will begin and the timer will reset to 20 minutes, zero seconds, and count down towards zero.

Pedal as hard as you can for the 20 minute testing period. As you do the test your body will adjust naturally: if you start out too hard your performance will fall-off later in the test. If you have energy to spare in the last few minutes you can "pour it on".

During the test you will see your average watts in the top screen, your instantaneous watts in the middle window, and the elapsed time of your test in the bottom window. Here is an example of how the screen might look:


This screen shows that this rider has 18 minutes, 32 seconds remaining on the test (bottom window), and that, up to this point of the test, the rider has sustained an average of 218W (top window). The middle screen shows the watts output at the instant of the photo: 191W. So, the rider's wattage output AT THAT INSTANT is below the average. The down arrow to the left of the reading 191W indicates that the instantaneous wattage output is below the average watts output.

During the 20 minute test pedal your bike as aggressively as you can and try to keep those watts up.

> **TIP**: 20 minutes is a long time! You'll see that both average and current watts are displayed on the Newton. Both of these numbers will help you keep a good pace. For example, if you start off way too hard your current watts will be huge for a few minutes and your average watts will be high too. However, you will be unable to maintain the pace for 20 minutes and will fade: your current watts will diminish because you are tired. Your Newton screen will report that your current watts are below your average watts, indicating that you "blew up" too soon. If you blow up prior to the end of the test then you won't have a W/KG measurement that reflects your potential. **Work hard, but try to keep an even pace throughout the ride.**

During the test a situation may arise where you need to stop (say, at a traffic light). If that happens you can pause the test by clicking the center button. The screen will say "hold test":
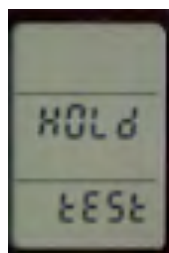
To resume the test, click the center button.

Finally, if for some reason you don't like how your test is going you can abort the test at any time by pressing and holding the center button for about 5 seconds. The screen will say "Test Abrt" (test abort) and the test will end. The W/KG and fitness score result from your earlier test will be remain in memory.

At the end of the ride your Newton will compute your watts per kilogram and show you your fitness level.

TIP: THE NEWTON MEASURES YOUR "FUNCTIONAL THRESHOLD POWER" (FTP) AS A TRAINING AID. AT THE END OF YOUR FITNESS TEST THE NEWTON WILL AUTOMATICALLY UPDATE YOUR FTP NUMBER, LOCATED IN THE "RACR/FTP CFG" SCREEN. OR, IF YOU KNOW AND ENTER YOUR FTP NUMBER IN THE FTP CFG SCREEN, THE NEWTON WILL AUTOMATICALLY COMPUTE YOUR 20 MINUTE W/KG AND FITNESS RATING.

RACR SEQUENCE

The Racr (racer) sequence contains settings of interest to advanced power meter users and bike racers.

To access the RACR sequence, enter Setup then scroll to RACR. If the screen says RACR YES then click up arrow button to enter the sequence; if the screen says RACR NO, then click the center button, select YES with the up arrow, then click the center button to accept. Then, click the up arrow to enter the RACR sequence. Here are the steps included in the RACR sequence:

"RACR YES", then click up/left arrow successively to perform:

- Estimate frictional drag: "**EST FRIC**"
- Display TSS/IF/NP measurements in the Totals screen: "**TSS**"
- Configure Functional Threshold Power: "**FTP CFG**"
- Display CdA data on screen (NOTE: iAero feature ONLY): "**CdA**"
- Set total hours logged: "**TOTAL HRS LOG**"
- Turn cadence display On/Off: "**Cad On**"
- Set total distance logged: "**TOTAL ODO**"

Each of these settings is explained below:

- "**EST FRIC**" (estimate Frictional drag)

Bikes have an intrinsic level of rolling resistance (frictional drag) that is dependent on tire type, tire pressure, and road surface. This factor is called "Crr" (coefficient of rolling resistance) and Crr is a number generally between 0.003 and 0.008. The higher the Crr the higher the rolling resistance.

For example, with normal bike tires a very smooth velodrome track will have a Crr of about 0.003; asphalt will have a Crr of about 0.0055, and dirt roads will have a Crr of 0.008 or higher.

The Newton's coast down process can measure Crr (in addition to CdA, the aerodynamic resistance) but in many cases it's easier and faster just to assume a value for Crr. Assuming a value of Crr can improve the accuracy of the CdA measurement.

The default setting for EST FRIC is YES; that is, in the EST FRIC YES setting the Newton will assume a fixed, user-set value of Crr, *even when coast downs are performed*.

The default value of Crr has been set at the factory to 0.0055; on the Newton, this reads as "55" in the screen. The value of Crr can be set by the user.

To use the estimated Crr feature do the following:

1) Go to Setup/RACR YES/EST FRIC.
2) Click the center button; the bottom screen flashes. Use the up arrow to select YES, then click the center button to accept. "done" flashes
3) The screen FRIC appears; the number at the bottom is the value of Crr currently stored in the Newton.
4) To change the value of Crr (fric) click the center button. Adjust the digits to the value you want. Fric = 30 corresponds to a very smooth velodrome; 55 is an average asphalt road; 80 is rough concrete; 100 or higher is dirt roads. These values are approximate; you can get more exact values from the web.
5) When you've entered the value you want, click the center button to accept. Done flashes and the Newton proceeds to the next RACR screen, TSS

> **REMEMBER**: IF YOU SET EST FRIC TO "YES" THE VALUE SHOWN WILL BE USED BOTH IN ESTIMATED DRAG COEFFICIENTS AND AS THE ASSUMED VALUE IN COAST DOWNS.

If you do NOT want to use the estimated Crr feature do the following:

1) Go to Setup/RACR YES/EST FRIC.
2) Click the center button; the bottom screen flashes. Use the up arrow to select NO, then click the center button to accept. "done" flashes and the Newton proceeds to the next RACR screen, TSS

> **IMPORTANT**: WHEN EST FRIC IS "OFF", COAST DOWNS WILL MEASURE BOTH AERO *AND* FRICTIONAL DRAG.

> **TIP**: WHEN COAST DOWNS ARE DONE WITH EST FRIC "OFF", THE CRR CORRESPONDING TO THE MEASURED FRICTIONAL DRAG WILL APPEAR IN THE EST FRIC WINDOW.

- **TSS ON/OFF**

The Newton incorporates special measurements to help serious cyclists improve their training. These three measurements, called Training Stress score (TSS[TM]), Intensity Factor (IF[TM]), and Normalized Power (NP[TM]) are described in the Appendix.

Normally, TSS, IF and NP measurements are not visible in the Newton's Totals screen ("TSS OFF"). If you'd like to see them, then do the following:

1) Go to Setup/RACR YES/TSS.
2) Click the center button; the bottom screen flashes. Use the up arrow to select YES, then click the center button to accept. "done" flashes and the Newton proceeds to the next RACR screen, "FTP CFG"

- **FTP CFG (Functional Threshold Power Configuration)**

Functional Threshold Power is another specialized measurement of interest to advanced cyclists. FTP is described in the Appendix.

There are two ways your functional threshold power can be determined:

1) By direct measurement in a 1 hour test
2) By estimate, based on the 20 minute Newton Fitness Test

If a Newton Fitness Test is performed then FTP = avg. watts from 20 minute test * 0.95

> **IMPORTANT**: WHENEVER YOU DO A NEWTON FITNESS TEST, YOUR ESTIMATED FTP WILL BE AUTOMATICALLY COMPUTED AND STORED.

If you have measured your FTP by some other means, you can override the results of the Newton Fitness Test and enter your FTP directly

> **IMPORTANT**: IF YOU ENTER YOUR FTP DIRECTLY, YOUR NEWTON FITNESS TEST WILL BE UPDATED. YOUR W/KG SCORE AND YOUR FITNESS LEVEL WILL CORRESPOND TO YOUR FTP RESULT

You can see, and change, your FTP number as follows:

1) Go to Setup/RACR YES/FTP CFG.
2) Click the center button; the bottom screen flashes and shows your current value of FTP. If you've done a Fitness Test, the FTP is based on the Fitness Test. If you haven't done a fitness test, a default value o 0001 (1Watt) will be shown
3) If you wish to change the FTP number do so
4) To accept your choice or exit the item, click the center button to accept. "done" flashes and the Newton proceeds to the next RACR screen, "CDA"

- **CDA ON/OFF (Newton + only)**

CdA is an important aerodynamic measurement that can be displayed on the screen of the Newton + only. You can read about CdA measurements in your iAero manual.

If you wish to see CdA measurement on the bottom window of your Newton + power screen do the following:

1) Go to Setup/RACR YES/CDA ON-OFF.
2) Click the center button; the bottom screen flashes. To turn CDA on select "ON" with the up arrow.
3) If you don't want to see CdA measurements on your Newton + click the up arrow to select "OFF".
4) To accept your choice click the center button; the screen flashes "done" and the Newton advances to the next menu item, "TOTAL HRS LOG"

- **TOTAL HRS LOG**

You can set the Newton's hours-on-bike log to start at a number other than the default number of zero. This is a handy feature if you want to copy this value from your old bike computer. Click the center button to set the log; when finished, click the center button to accept. "done" will flash and the Newton will move to the next screen, "TOTAL ODO"

- **CAD ON/OFF (cadence display on/off)**

For Newtons with cadence sensors, the display of the cadence measurement is turned on or off in this setting. The default value is On; cadence (and HR if available) alternate back and forth in the bottom window of the Power Screen. if Cad is set to "off", then cadence will not be shown in the bottom window of the power screen. If you are using an HR strap and Cad is "Off", then HR will be shown continuously.

- **TOTAL ODO (total Odometer)**

You can set the Newton's odometer to start at a number other than the default number of zero. This is a handy feature if you want to copy your odometer setting from your old bike computer. Click the center button to set the log; when finished, click the center button to accept. "done" will flash and the Newton will move to the next screen, "RACR NO"

IMPORTANT: UPON COMPLETION OF THE "TOTAL ODO" SETTING YOU WILL EXIT THE RACR SEQUENCE AND THE NEWTON WILL AUTOMATICALLY CHANGE THE SETTING TO "RACR NO".

DAY-TO-DAY SETUP SCREENS

Your Newton setup is designed around one-time <u>setup sequences</u>. Once these sequences are performed, you'll rarely need to access them to make changes. So, unless you choose to reveal the sequence steps, they'll remain hidden from view.

Some Newton setup and calibration steps are very common, so much so that you'll want easy access to them. We've gathered the most common setup items together as "day-to-day" screens that you'll find whenever you enter Setup.

All of the day-to-day setup screens are listed below. Many of them have been described so we won't repeat their function here. The new screens will be in **BOLD**:

1) **CAL WIND**
   This <u>optional</u> calibration is the first screen you'll see when entering Setup. Once you click the center button to perform the wind calibration, your Newton will automatically exit setup after a few seconds, OR you can click the up arrow to move to the next screen:
2) TILT
3) CAL RIDE
4) **BATT % (battery voltage percentage)**. Use this screen to find out the percentage of battery energy remaining in your Newton
5) **ALT (altitude)**

   Use this screen to enter the starting elevation for your ride.

> **TIP**: THE STARTING ELEVATION IS OPTIONAL AND NOT REQUIRED FOR ANY NEWTON CALCULATIONS

> **IMPORTANT**: EVEN IF YOUR NEWTON HASN'T BEEN MOVED, THE STARTING ELEVATION WILL CHANGE WHEN WEATHER CONDITIONS CHANGE. THIS IS NORMAL.

6) TOTAL WGHT
7) SCAN (Wireless Setup)
8) SET PROF
9) **REC INT (RECORD INTERVAL)**

Your Newton's memory will fill with information as you ride. You can select in this screen how often to record your ride information:
   Click the center button, then select 1 sec (one second recording interval) to record about 20-40 hours of data (Newton + has twice the memory storage of the Newton), OR
   Click the up arrow to select 5 sec (five second recording interval) to record about 100-200 hours of data.

> **TIP**: YOU CAN HAVE AS MANY RIDE FILES AS YOU WANT. THEIR TOTAL TIME LENGTH IS DETERMINED BY YOUR RECORDING INTERVAL

> **TIP**: YOU'LL GET WARNING MESSAGES WHEN YOUR RIDE MEMORY IS NEAR CAPACITY. IF YOUR RIDE MEMORY FILLS TO 100% DURING A RIDE YOUR NEWTON WILL CONTINUE TO FUNCTION BUT YOU'LL LOSE THE RIDE DATA FOR THAT RIDE.

10) **ERAS DATA (ERASE RIDE DATA FROM NEWTON)**

After downloading your rides to your Isaac software (see the Isaac software instructions) you can erase your ride data with the Isaac software.

Alternatively, you can erase your ride data directly on your Newton:

- Click the center button. The word "NO" flashes. If you do NOT want to erase your data, click the center button
- If you DO want to erase the data, click the up arrow. The word YES flashes. Click the center button to confirm your choice and erase the data. The word "done" flashes for a few seconds.

11) **REL (firmware release number)**

This screen shows the firmware version installed in your unit. You can update can your firmware to the latest version using the Isaac software. See the Isaac Software instructions for details.

USING THE INDOOR TRAINER FEATURE

The Indoor Trainer feature allows you to measure power with your Newton when using many models of indoor trainers and rollers. Consult the Isaac software, "Device/Edit Trainer Settings…" for a complete list of supported trainers and rollers.

When using the indoor trainer function your Newton must measure the speed of the rear wheel. Therefore, you will need to use a wireless mount, with speed sensor mounted on the rear wheel. The Newton uses the trainer profile to estimate the power required to produce the measured rear wheel speed.

The Indoor Trainer function is standard on the Newton + and is an optional upgrade for the Newton.

Here's how turn the Indoor Trainer function "On":

1) Make sure your speed sensor is mounted on the rear wheel of your bike
2) Use the Newton software to install the select and install the profile for your indoor trainer, "Device/Edit Trainer Settings…"
3) To turn the trainer function ON, enter Setup and click the bottom arrow repeatedly to find "User". If "User/No" is on the screen, click the center button to make the word "Yes" flash. Then, click the center button so that "User/Yes" is displayed without any flashing.
4) With "User/Yes" shown, click the up arrow one time. "Trnr" is shown. If "Trnr/Off" is shown, click the center button so that Off flashes. Click the up arrow so that "Trnr/On" flashes.   Click the center button to accept. "Trnr/On" is shown.
5) Exit Setup. Your Newton is ready to use with your indoor trainer.
6) When downloading ride files recorded with the Indoor Trainer function On, the status window of your Newton software will read "Indoor Trainer".

How to turn the Indoor Trainer function "Off":

When riding outdoors you need to turn your Indoor Trainer function off so that the Newton's power measurement sensors will function normally:

1) To turn the trainer function Off, enter Setup and click the bottom arrow repeatedly to find "User". If "User/No" is on the screen, click the center button to make the word "Yes" flash. Then, click the center button so that "User/Yes" is displayed without any flashing.
2) With "User/Yes" shown, click the up arrow one time. "Trnr" is shown. If "Trnr/On" is shown, click the center button so that "On" flashes. Click the up arrow so that "Trnr/Off" flashes.   Click the center button to accept. "Trnr/Off" is shown.
3) Exit Setup. Your Newton is ready to use on your outdoor rides.

NOTE: YOUR NEWTON WILL NOT PROVIDE ACCURATE WATTS READINGS IF "TRNR/ON" IS USED DURING OUTDOOR RIDES.

OTHER SPECIAL FEATURES

There are some other very useful features available with your Newton.

SPECIAL FEATURE #1: "AUTO HILL"

You're riding along on the flats but you see a steep hill ahead. Once you start climbing you'll want to know: how tough is the climb? Your Newton can tell you AUTOMATICALLY.

Anytime you ride on a hill slope higher than two percent, the top window of your main screen will AUTOMATICALLY alternate between your bike speed and the hill slope.

Once the hill slope drops below 2%, the Auto Hill feature will automatically cancel.

TIP: BY DEFAULT AUTO HILL IS TURNED "OFF". PRESS-HOLD THE BOTTOM ARROW FOR TWO SECONDS TO TURN AUTO HILL ON ("Hill Auto"). DO THIS AGAIN TO TURN AUTO-HILL OFF ("Hill OFF").

SPECIAL FEATURE #2: "LAP TIMER"

Your Newton screens display information about each Newton Trip, while simultaneously storing all your trip ride data in memory. But if you're racing in a crit or training on a route where you're doing multiple laps you will likely want to compare your performance from lap to lap.

The Newton has a lap timer that lets you see your important lap stats (lap number, average speed, average watts, and lap time) *while on the bike* and that marks those laps in your ride file for later analysis.

Each time you press-hold the left arrow for two seconds, four things happen:

1) The previous lap ends, and the screen flashes the lap number that has just ended
2) Stats from the previous lap are flashed on the screen for about 10 seconds (average speed, average watts, lap time)
3) A new lap is started and stats are gathered in the background for the new lap
4) Your Newton automatically returns to the main screen

The lap timer automatically resets to lap 1 whenever you perform a "trip reset" command. So, if you're racing, perform a trip-reset while waiting at the starting line; your first lap will start recording lap one.

When you've finished your ride you can download your ride, then perform a trip-reset to reset your lap timer.

SPECIAL FEATURE #3: "TIME-TRIAL INTERVAL WORKOUTS"

Suppose you're going to do a time trial; the time trial can be thought of as one huge interval. The Newton gives you a way to manage your time trial so you can see average watts, actual watts, and elapsed time, all on the same screen. Here's how:

1: Press-hold the right arrow to enter FIT TRAIN.

Use the left/right arrow to select "USER":

2. To start the first User Interval, click the center button or just start pedaling; when you start moving the User Interval will start automatically.

3. You'll see average watts in the top window, actual watts in the middle screen, and elapsed time in the bottom window.

**NOTE**: IN THE TOP WINDOW THE LEAST SIGNIFICANT DIGIT OF THE AVERAGE WATTS NUMBER WILL BE SUBSCRIPTED. FOR EXAMPLE, AN AVERAGE WATTAGE OF 198W WILL SHOW IN THE TOP WINDOW AS 19_8

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4. **To end an interval, click the center button**. The prior user interval will stop and a new user interval will begin immediately.

5. **During any user interval you may pause the interval by clicking the left arrow**.

To resume the interval, click the left arrow again.

6. At any time, you may review the results of all prior user intervals by clicking the up arrow. You'll see the interval number in the top window, average watts for the interval in the center window, and elapsed time for the interval in the bottom window.

7. To exit the user interval, press-hold the right arrow. The message "End Train" will appear:
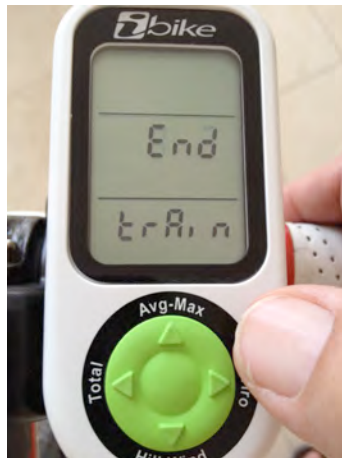
SPECIAL FEATURE #4: "PRE-PROGRAMMED FITNESS WORKOUTS"

Your Newton is equipped with pre-programmed workouts that are linked to your fitness score. There are three types of *pre-programmed* workouts: fat burning, cardio, and strength. You can select any of these different workouts to help improve your cycling, quickly and efficiently. Also, the workout intensity is controlled by your fitness score, so you won't work either too hard or too little.

Here's a summary of how to use your Newton for fitness workouts.

1) Perform the fitness test.

2) Decide what kind of workout you want to do. There are three pre-programmed workouts: fat burning, cardio and strength.

3) Press-hold the right arrow. You will enter "FIT TRAIN".

4) Use the left or right arrow to select the kind of workout you want.

5) For the workout you've selected, you can choose from three levels of difficulty: 0, 1, (and sometimes 2. 2 is the most difficult and is available only with some workouts). Use the up/down arrows to select workout intensity.

6) When you're ready to do you workout, click the center button. You'll see your target watts in the top window, your actual watts and number of remaining intervals in the center window, and the time remaining for the interval in the bottom window.

7) As each interval ends, the interval counter will decrement by one and the target watts and time for the next interval will appear. Continue with the workout until the set is finished.

8) To exit the interval workout, press-hold the right arrow.

SPECIAL FEATURE #5: "USER-PROGRAMMED INTERVAL WORKOUTS"

Not only is it possible to use the Newton with the pre-programmed workouts described in Special Feature #3, it is also possible to create your own power-based interval set.

How to Create a Custom Interval Set

Interval programs are created in the Isaac software. Consult the Isaac software instructions to learn how to create interval sets.

Here is an example interval set, created in the Isaac software.   In this example interval set there are five intervals: the first interval is 150W for 4 minutes, followed by 5 minutes of rest, followed by a second interval of 200W for 3 minutes, with a 5 minute rest thereafter, and a third interval of 250W for 2 minutes, followed by a 5 minute rest period, a fourth interval of 200W for 3 minutes with a 5 minute rest, and a final 150W interval for 4 minutes with a final 10 minute rest/cool-down.
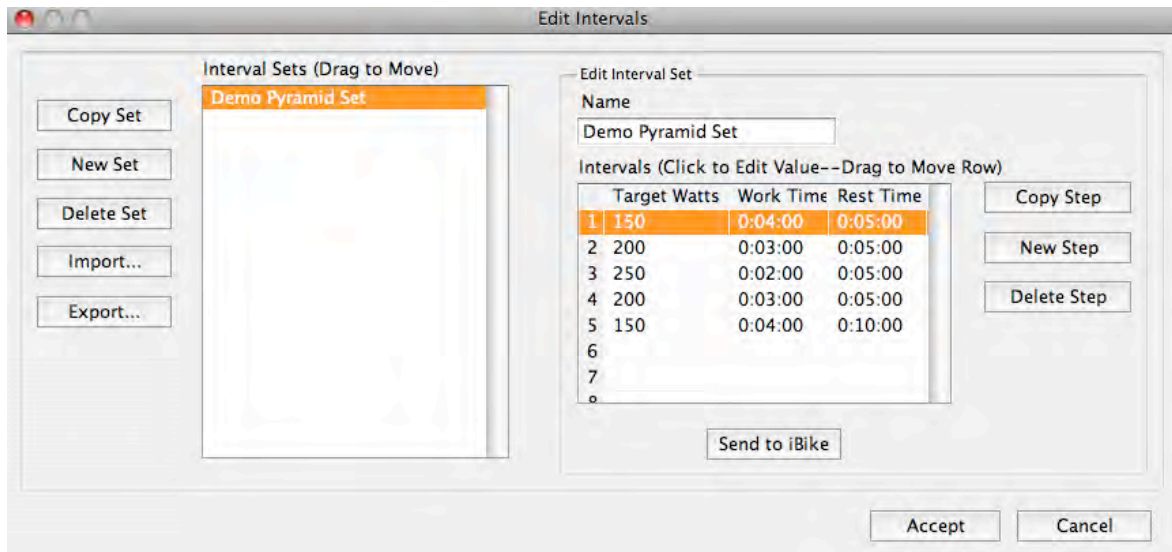
Uploading a Custom Interval Set into your Newton

After you've created your custom interval set, simply click the "Send to iBike" button, located on the Edit Intervals window. Your interval set will be transferred to your Newton.

> **TIP**: YOUR COACH CAN CREATE INTERVAL SETS FOR YOU WITH HIS COPY OF Isaac SOFTWARE. HE WILL SEND YOU THE INTERVAL SET FILE, WHICH YOU'LL IMPORT INTO YOUR EDIT INTERVALS WINDOW WITH THE "IMPORT" BUTTON. ONCE YOU HAVE IMPORTED THE SET, HIGHLIGHT IT TO SELECT IT, THEN CLICK THE "SEND TO NEWTON" BUTTON.

Selecting and Using the Customized Interval Workout on your Newton

Once you have uploaded your customized workout, you'll need to tell your Newton that you want to perform the customized workout (instead of the pre-programmed workout).

This is extremely easy to do:

1) Press-hold the right arrow to enter FIT TRAIN.
2) With the left/right arrow, select iB3 (iBike software).
3) To start the workout, click the center button.
4) To end the workout, press-hold the right arrow.

TIP: INTERVAL PAUSE

You're in the middle of your interval training session and you have to stop because of a traffic light. What to do? Click the center button (of course!). Your interval timer pauses. When you're ready to resume interval training click the center button. Your interval training continues at the point where you left off.

TIP: INTERVAL SETS

You can repeat interval sets as many times as you like (or your body can stand). *How*? At the end of your first set click the center button (what else?) and hold for 3 seconds. The word "Set" will flash in the center window, and the word "no:" and a number will flash in the bottom window. For example, the second set will be "Set No: 2". Of course, the set counter will increment each time you do a new set.

TIP: USING THE INTERVAL TRAINER WITH YOUR BIKE COACH

Your bike coach can create and email to you interval training files for your Newton. Your Isaac software is used to upload the training interval into your Newton. And, after you've downloaded your ride data to your PC/Mac, you can send your coach the actual ride data from your interval training session. That data will include hill slope, wind speed, altitude gained, and temperature, in addition to the usual time/distance/speed data. See the Isaac software instructions for more details.

Make sure to tell your coach that the Isaac software is free and available on our website www.ibikesports.com/downloads/html . This software can be used both to view your ride files and to create Intervals.

TROUBLESHOOTING

Problem: The Newton screen is blank even when I click the buttons
Possible causes:
   1)   The Newton battery is dead. Recharge your battery using the USB cord and
         i.   user-supplied USB charger
   2)   Do a Hard Reset. Press-hold the center, left, right, and bottom buttons
         simultaneously
   3) A firmware update has been interrupted during loading and has "frozen" the
   Newton. Contact technicalsupport@velocomp.com to diagnose.

Problem: The Newton screen doesn't show bike speed
Possible causes:
   1) The spoke magnet is not properly positioned. The spoke magnet must pass by
the vertical notch of the speed sensor, no more than 1-2 coin widths from the sensor.
   2) The wireless speed sensor battery is dead or is not installed. Replace the battery
in the sensor (CR2032 battery).
   3) Sensor is defective. Email or call iBike technical support for assistance.
   4) Tire circumference has been set to zero in the Setup screen. Set tire
   circumference properly (2096 is the default value).

Problem: Power readings seem to be "off" for the entire ride
Possible causes:
   1) Basic information was not entered. See instructions to correct.
   2) Calibration ride was not performed.
   3) Newton handlebar mount rotates on handlebars. Tighten mount: see instructions
to correct, then recalibrate. Make sure to use double-sided stickies!
   4) Wind sensor has obstructed access to wind (hands, cables, etc.). See
instructions to correct.
   5) Coast Downs were done improperly. Go to the USER sequence and perform the
"EST AERO" procedure.

***Problem: Power readings seem to be "off" for first five minutes only, then
become "normal"***
Possible causes:
   1) Tilt calibration was not performed. See instructions to correct.
   2) Calibration Ride was not performed. See instructions to correct

Problem: I get very low watts readings or zero watts readings.
Possible causes:
   1) Your cadence sensor has been bumped away from the cadence magnet.
      Whenever cadence is zero, watts will be forced to zero. Make sure the cadence
      magnet passes within two coin thicknesses of the cadence sensor.
   2) CAL RIDE has not been done. Perform a Cal Ride.
   3) Drag coefficients have been set to zero. You can check this by clicking the left
   arrow 6 times to read the aero coefficient. Click again to read the frictional
   coefficient. If either is zero, do a new EST CDA.
   4) Tire circumference has accidentally been set to zero. Check this by going to
   Setup/Tire Circ (tire circumference). If zero, set to correct value.

Problem: Unit locks-up (screen displays numbers but buttons don't work)

       To correct this condition, perform a "Hard Reset" by press-holding the left, bottom, right, and center buttons simultaneously. Release the buttons when the screen goes blank.

Problem: I can't download data to my computer and/or upload data to my Newton

Possible causes:

       1) Newton is sleeping (nothing is visible on the display screen). Click the center button to turn on the unit and make the display visible.

       2) USB cable isn't plugged into your computer.

       4) Isaac software and/or USB drivers are installed improperly. Contact Technical Support for assistance.

APPENDIX 1

NP, TSS, IF, and VI: WHAT ARE THEY, AND HOW DO I BENEFIT FROM THEM?

Your Newton includes Normalized Power™(NP), Training Stress Score™ (TSS), and Intensity Factor™ (IF) measurements. If you are a seasoned veteran of power training, you realize how important this information can be, and how great it is that the Newton can display this information on the road.

TSS, IF, and NP were developed by well-known exercise physiologist Dr. Andrew R. Coggan. These three measurements use the "raw" power data from your Newton, along with sophisticated mathematical formulas, to provide more detailed information about the intensity and quality of your workouts. If you have never heard of these three useful factors, then keep reading to find out what they are and how they can help you get the most out of your workouts and your fitness improvement goals.

Getting Started: Determining Your Functional Threshold Power (FTP)

Before you can obtain TSS, IF and NP measurements you need to have a "baseline" that characterizes your current level of fitness. This reference point is called your "Functional Threshold Power", or FTP.

One way to determine your FTP is to do a one hour Time Trial; your average watts for that one hour period is your FTP. Another way to estimate your FTP is by using the Newton's 20 minute fitness test. The Newton 20 minute fitness test is similar to a time trial, just shorter in time. To estimate your FTP from the Newton fitness test, take the watts per kilogram number shown in your "FIT TEST" screen, multiply that number by your weight (in kilograms), then multiply that number by 0.95. For example, if your W/KG measurement is 3.02 and your weight is 81KG, then your estimated FTP is 3.02 *81 *.95 = 233W.

Once you have determined your FTP number from either method, you must enter that value into the Newton. Go to Setup/FTP CFG (FTP Configuration). Click the center button, then use the arrows to enter your FTP in watts. Click the center button to Accept.

If you're training regularly you'll want to check your FTP about once a month.

Normalized Power (NP)

Have you ever participated in a group ride where your watts are never steady? Group rides can be very difficult, but afterwards you might suspect that your average watts don't accurately reflect how difficult the ride was. The disparity between measured and perceived effort is due to coasting, surging, using brakes, and soft pedaling. In fact, your average watts will be lower than your perceived effort suggests. This is where Normalized Power (NP) comes in.

NP takes your "raw" power data and gives you a related power measurement number (reported in watts) that better represents the "tax" on your body for the ride, especially when you're varying your power output considerably from moment to moment. For example, in a criterium, the NP number will be much higher than the average power because the NP measurement does a better job of accounting for the effects of coasting and large power surges. The NP number will be more representative your effort for the

ride.

In events such as a time trial or climbing hills where the wattage holds very steady, NP and average power will be very close to each other because you pedal almost all the time.

Using Intensity Factor (IF) to gauge the difficulty of your Workout
If you do cycling workouts regularly you know that some of your workouts are more intense than others. Average power and NP alone won't quantify the intensity of your workout, because the intensity of a workout is not based on power output alone but *also* the time length of your workout *and* how hard you work during each moment of your workout.

Normalized Power (NP) and Functional Threshold Power (FTP) can be used *together* to quantify the overall intensity of each of your workouts. The Intensity Factor (IF) is very simple to calculate: divide your NP by your FTP. The number IF represents the intensity of your workout as compared to the effort you expend in a one hour Time Trial. So, an IF of 1.0 represents a time trial effort and in theory can only be maintained for an hour.

One of the great things about an IF measurement is that you can manage your training schedule to make sure you're training hard, but not training too hard. Here are some values for IF and the kind of rides they represent:
  • Less than 0.75 - recovery rides
  • 0.75-0.85 - endurance-paced training rides
  • 0.85-0.95 - tempo rides, aerobic and anaerobic interval workouts (work and rest periods combined), longer (>2.5 h) road races
  • 0.95-1.05 - lactate threshold intervals (work period only), shorter (<2.5 h) road races, criteriums, circuit races, longer (e.g., 40 km) TTs
  • 1.05-1.15 - shorter (e.g., 15 km) TTs, 10 minute hill climb
  • Greater than 1.15 - prologue TT, track pursuit, 5 minute hill climb

One more way to gauge your workouts: Training Stress Score

We now know the true tax on our body (NP), and how intense each workout is (IF) compared to a reference one hour TT, but there is still one more thing to think about. For example, what is the comparative stress on the body from riding at 50% of our FTP for two hours, compared to a 100% FTP effort for one hour? A simple number called Training Stress Score (TSS) allows you to quantify and compare your different workouts, even when they are considerably different in time length and power intensity.

TSS is designed to give you a numeric value for each ride that tells you how much training load was on your body for that day's ride. A TSS of 100 equals an hour at an IF of 1.0. So, if you were out for a fairly easy four hour ride, and accumulated 200 TSS points, it's the same training load as doing two hours at time trial pace.

Importantly, TSS also quantifies how tired you can expect to be after a workout and how long the residual fatigue might last.
  • Less than 150 - low (recovery generally complete by following day)
  • 150-300 - medium (some residual fatigue may be present the next day, but gone by 2nd day)
  • 300-450 - high (some residual fatigue may be present even after 2 days)
  • Greater than 450 - very high (residual fatigue lasting several days likely)

Where to find your TSS, IF and NP factors in your Newton screen

After each ride you'll find your TSS, IF and NP measurements in the Totals screens (left arrow). Click the left arrow to find your scores.

Whenever you do a Trip Reset (press-hold center button, then click to confirm) these three measurements will be reset to zero.

Variability Index (VI)

This number is the ratio of your Normalized Power to your Average Power. VI is an indicator of the extent to which your Normalized Power varies from your average power, due to factors such as surging and coasting. The closer VI is to 1.00, the more constantly you are pedaling at a constant level of power.

Note the the VI measurement is available only in the Isaac software.

Summary

By looking at your TSS, IF and NP numbers after each ride you can track your workouts based on data from your own personal FTP number. Furthermore, these three metrics can be used to diagnose workouts and even prescribe rest days.

If you can normally ride two hours at an IF of .9, but today you really struggled, it might be time for a couple of easy recovery rides (IF of under .7). Using this information can make your Newton power data even more personalized to you, and help you maximize the effectiveness of your training.

For more detailed explanations of NP, IF, and TSS, see the Trainingpeaks article at: http://home.trainingpeaks.com/articles/cycling/normalized-power-intensity-factor-training-stress-score.aspx

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Training Stress Score™ is a trademark of Peaksware, LLC

IF™ is a trademark of Peaksware, LLC
Intensity Factor™ is a trademark of Peaksware, LLC

NP™ is a trademark of Peaksware, LLC
Normalized Power is a trademark of Peaksware, LLC

APPENDIX 2: FREQUENTLY ASKED QUESTIONS

WHERE DO I FIND THE SERIAL NUMBER FOR MY NEWTON?

The serial number is stored in your Newton's internal memory. You download the serial number using the Newton software. Consult your Newton software manual for serial number downloading instructions.

HOW DOES THE NEWTON® POWER METER WORK?

The iBike Newton power meter uses a revolutionary approach to power measurement that is based on Newton's third law:

> *"For every action there is an equal and opposite reaction"*

In bicycling terms, this means that the factors causing the cyclist to expend power during a bike ride (hill climbing; opposing wind; tire, bearing and other losses; bike acceleration) are equaled by the power applied through the pedals by the rider.

With the exception of the Newton, all other high performance power meters determine power by measuring the forces *applied* by the rider to the pedal. Directly measuring applied pedal force is an accurate way to derive power, provided the cyclist is willing to accept the weight, cost, installation, inflexibility, and operational penalties that are characteristic of a direct-force power meter (DFPM).

In radical contrast, the Newton uses state-of-the-art sensors, along with new and patented technology, to measure the opposing forces that cause the cyclist to *expend* power: opposing wind, hill climbs, bike acceleration, and rolling friction of the bike and tires.

A powerful microprocessor, programmed with proprietary DSP filters and real-time solutions to the dynamic power equation, processes the output from the Newton sensors many times per second, computing the total power demands created by hill slope, wind, etc. And thanks to Newton's third law, measuring the power <u>consumed</u> by hill climbing, overcoming wind resistance, etc. provides a comprehensive and accurate measurement of the power <u>generated</u> by the cyclist.

The Newton uses four sensors:
- an accelerometer to measure hill slope and bike acceleration/deceleration forces,
- a differential pressure sensor to measure wind speed forces,
- an absolute pressure sensor to measure elevation gain, and
- a wheel pickup to measure bike speed.

All sensors except the wheel pickup are located within the Newton housing, making it possible to use the Newton, quickly and easily, on all of your bicycles.

HOW IS HILL SLOPE CALCULATED?

When you climb a hill your bike's movement has two components of motion: the total distance traveled forward on the road, and the vertical distance traveled up the hill. The "Hill Slope" is the ratio of vertical movement to forward movement, expressed as a percentage.

> *Example:* You travel 1000 feet forward and climb 100 feet vertically. Your hill slope is 100/1000 x 100% = 10%

The accelerometer in the Newton measures hill slope instantaneously, much faster and more accurately than GPS or barometric pressure methods.

HOW ACCURATE IS THE HILL SLOPE MEASUREMENT?

Your Newton uses an accelerometer that measures hill slope and bike acceleration simultaneously. When your bike is at rest or you ride at a constant speed (in either case there is no bike acceleration) the hill slope displayed on your screen is very accurate (within 0.1% of the actual slope). When you are accelerating on your bike (going faster, coasting on a downhill, or braking) the hill slope may jump around a bit because the accelerometer not only senses hill slope but bike acceleration as well. In this circumstance the hill slope displayed on the screen will be only approximately correct (generally within 1% of actual slope). NOTE, HOWEVER, THAT WATTS ARE CALCULATED WITH HIGH PRECISION UNDER THESE RIDING CONDITIONS, *including those where the hill slope displayed is "off".*

WHAT IS THE RELATIONSHIP BETWEEN THE AERODYNAMIC AND FRICTIONAL DRAG COEFFICIENTS THE Newton MEASURES, AND CdA AND Crr?

The Newton measures aerodynamic (CdA) and frictional drag (Crr) coefficients in the coast down calibration, and estimates them accurately in Fast Start/Basic Setup. The numbers measured and reported on the Newton screens ("aero" and "fric") are related to, but not the same as, CdA and Crr. The value of aero can vary from 0.2 to 1.5, depending on the location of the Newton on the handlebars. The value of fric can vary from 5.00 to 25.00, depending on the weight of the rider.

NOTE: The Isaac software will report drag coefficients in CdA and Crr format. See the Newton software instructions for more details.

WHAT ARE TYPICAL VALUES OF CDA AND CRR?

CdA (coefficient of aerodynamic drag) is dependent mostly on ride position, rider height, and rider weight. The lower the CdA, the less effort that is required to overcome opposing wind.

The time trial position results in the lowest values of CdA: numbers between 0.22 and 0.28 are typical. The specific value will depend considerably on the details of bike type, rider position, and rider size.

The "drops" position is not as aerodynamically efficient. Values between 0.32 and 0.38 are typical.

The "hoods" position (hands grasping the brake levers) is the most typical riding position. CdA values of 0.34 to 0.43 are typical.

The CdA of a cyclist riding a comfort bike can be 0.45 or higher.
Crr (coefficient of rolling resistance) measures the amount of opposing friction caused by road surface, tire type, and bearing friction. A low value of Crr means low rolling resistance.

On a very smooth surface, such as those found at an indoor track, Crr can be 0.003. Asphalt roads have a typical Crr of 0.0055, and dirt roads can have Crr values of 0.008 or higher.

Values of CdA and Crr can be measured by the Coast Down procedure, or they can be

estimated accurately as part of the Fast Start sequence.

WHAT DOES "HEADWIND" MEAN?

The headwind speed that is displayed by your Newton is the TOTAL magnitude of wind blowing directly in your face *as you pedal*. A few examples make this easy to understand:

- You ride at 15mph directly into a 12 mph headwind. The Newton will read 27 mph headwind.

- You're going 18 mph and there is a cross wind of 10 mph. The Newton will display 18 mph as the headwind (remember, you're riding perpendicular to the wind's direction.)

- You're going 20mph and there is a tailwind of 10mph. Your Newton reads 10mph as the headwind (it knows you're getting a bit of a free ride from mother nature!)

NOTE: WITH "ABS WIND/YES" YOUR NEWTON WILL REPORT THE ACTUAL WIND SPEED.

UNDER WHAT CONDITIONS CAN THE NEWTON BE "LESS ACCURATE"?

There are two extreme riding situations where it is difficult for the Newton to measure watts with highest accuracy:
  1) Sharp turns such as hair-pin turns. During sharp turns when your handlebars are pointed into the turn your watts may read low. As soon as the turn ends your watt readings will return to full accuracy.
  2) When pedaling downhill, at high speed AND in a tuck. Any minor variation in ride position from your normal ride position (such as going into a tuck to pick up more speed), or any error in your drag coefficient measurement, can cause a false watts reading. The reason is simple: wind resistance varies as the cube of your speed, so high speeds "amplify" enormously the watts errors caused by ride position changes. As a practical matter, most riders DON'T pedal on downhills (it's a very poor use of rider energy) and when not pedaling, your Newton will report zero watts.

WHAT CAN I DO TO GET THE MOST ACCURATE RESULTS FROM MY NEWTON?

Your Newton will work extremely well when it is properly calibrated:

1) Perform the Fast Start sequence AND the Cal Ride. For the highest level of accuracy, you may also perform multiple Coast Downs after completing the Cal Ride. Make sure to use the Newton software to analyze your Cal Ride/Coast Down data.

HOW DOES THE NEWTON MEASURE TEMPERATURE?

The Newton measures the temperature at the wind port. If you've been riding and air is moving around your Newton, the temperature displayed will be close to the outdoor temperature. However, if your Newton has been sitting in the hot sun, without airflow over it, the display could show a significantly higher temperature.

NOTE: if you own a BLACK Newton, it will tend to over-report temperature by about 10F-15F, particularly in sunny weather.

I PURCHASED A FIRMWARE KEY FOR MY NEWTON. WHAT HAPPENS NEXT?

All purchase firmware keys are customized to the serial number of your Newton; until we have your correct serial number we can't create customized firmware updates for your Newton. Once you email us your serial number we will mail you your firmware key.

WHAT IS "TOTAL VERTICAL CLIMBED"?

Any time you climb, the Newton will accumulate the amount of elevation gain.

> Example: You climb a 100 foot hill, then descend 50 feet downhill, then slowly climb another 25 feet, and then ride back to your starting spot, descending 75 feet along the way. The Newton will show your Total Vertical as 100 + 25 = 125 feet.

DOES "TRIP RESET" ERASE SETUP, CALIBRATION, AND PREVIOUS RIDE DATA?

No! Your total odometer, tilt and coast down calibrations, wireless IDs, and other profile information are unaffected by trip reset. Also, any ride files recorded from prior rides is unaffected.

IS THE NEWTON SUITABLE FOR RAINY RIDES?

Yes! Your Newton was designed to be water resistant so don't worry if you get it wet. If the front port becomes filled with water your power readings may be wrong. To correct this problem, remove your Newton, blow the water out of the front port, and dry your mount and underside of the Newton with a dry cloth. Replace and continue on your ride.

TIP: IF YOU RIDE OFTEN IN RAINY CONDITIONS, CONSIDER PURCHASING THE OPTIONAL REMOTE WIND SENSOR (RWS). THE RWS WILL KEEP RAIN FROM FILLING THE NEWTON'S WIND PORT AND WILL IMPROVE WATTS ACCURACY DURING RAINY RIDES.

HOW DO I <u>HARD RESET</u> THE NEWTON?

Your Newton contains a microprocessor. It is possible, *though extremely unlikely*, that your Newton might experience a computer "freeze" malfunction. Symptoms of a freeze include: the buttons do not function properly, the screens are frozen, or you can't download rides. In this unlikely event a hard-reset may correct the problem. To do a "hard reset" press-hold the left, bottom, right, and center buttons simultaneously. The screen will go blank. Release the buttons to reset.

NOTICE: AFTER YOU DO A HARD RESET YOU WILL NEED TO RESET THE DATE AND TIME IN YOUR NEWTON. HOWEVER, YOU WILL <u>NOT</u> NEED TO RE-ENTER WEIGHT, TIRE CIRCUMFERENCE, AND CALIBRATION DATA. THAT DATA IS STORED PERMANENTLY IN THE NEWTON'S NON-VOLATILE MEMORY. ALSO, ALL OF YOUR STORED RIDE FILES WILL REMAIN IN YOUR NEWTON AFTER A HARD RESET.

OTHER QUESTIONS?

Please contact us anytime with your questions:

technicalsupport@velocomp.com